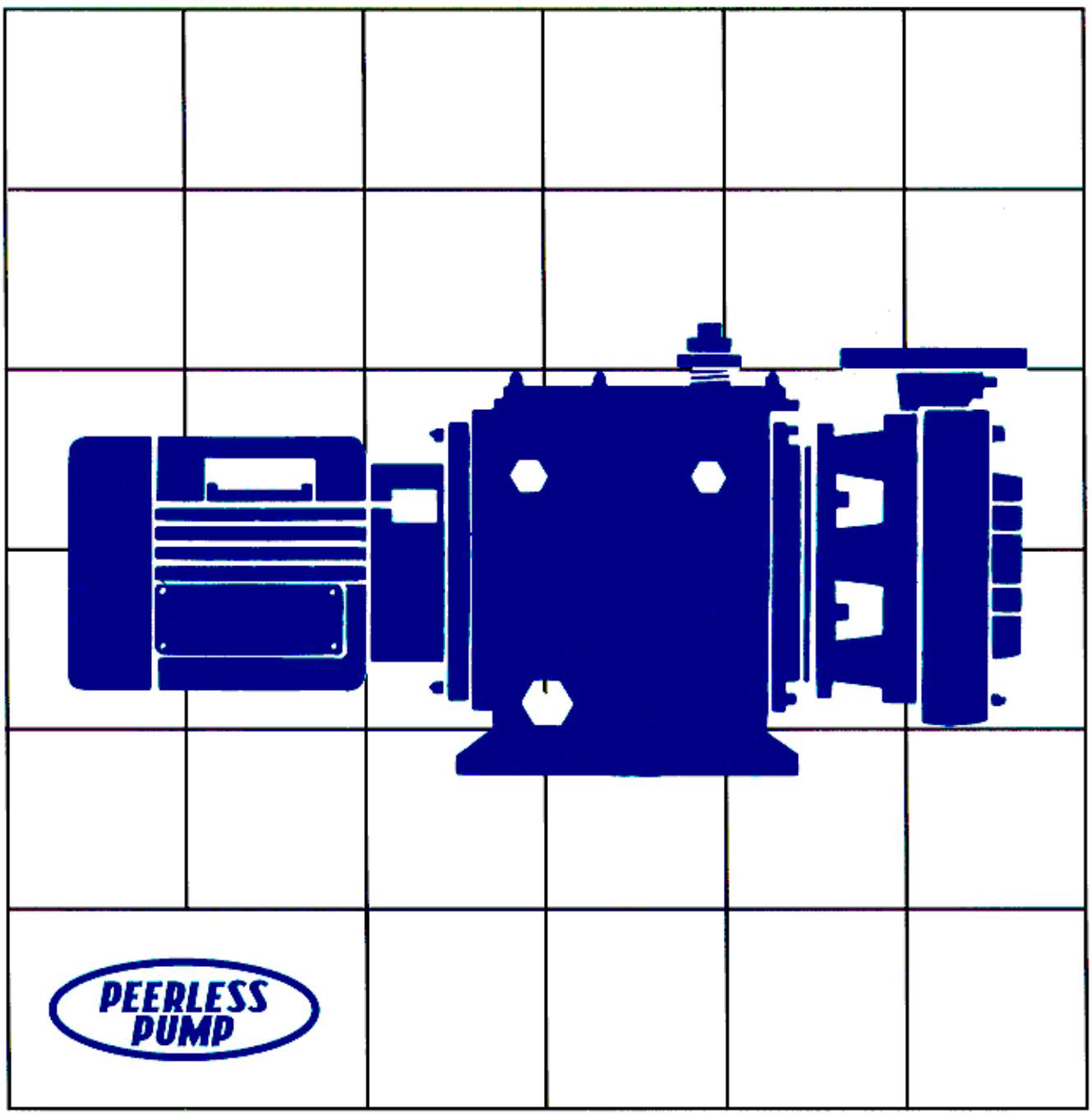
Peerless Pump Company

HORIZONTAL HYDROCONSTANT® VARIABLE SPEED DRIVES

Horizontal Types M,MO,MP and MX



Brochure B-4100A

Control the output speed of your pumps and fans with Peerless Hydroconstant® Drives

If you have a mechanical system such as a centrifugal pump, fan or similar device that needs to maintain operating pressure, temperature, liquid level, flow or differential pressure, then Sterling has a reliable and economical solution.

A Peerless horizontal Hydroconstant Variable Speed Drive.

Powered by an AC induction motor, Peerless Hydroconstant Drives transform a constant input speed into a variable output speed.

So now you can vary the speed of your pump or fan.

And when your machine is running at less than its maximum design conditions, the Peerless Hydroconstant Drives cuts power consumption. This result in substantial energy cost savings.

With four Peerless Hydroconstant Drive models to choose from, you can be assured of a reliable, cost effective Hydroconstant driven machine. No matter what type of pump or fan you have.

Simple design. Easy maintenance.

Peerless Hydroconstant Drives produce years of accurate, variable speed pumping.

We designed them to be simple. We build them sturdy. And we make them easy to install, operate and maintain.

Plus we added features that assure you of reliable, economical Hydroconstant drive:

- A soft, *no load* start reduces shock loading of your driven equipment.
- Smooth speed changes reduce potentially damaging pressure and flow surges in your system, minimizing water hammer.
- Our simplified construction requires no special tools or technical expertise to operate and maintain.
- Turbine oil, not totally confined in its enclosure, transmits the power, acting as a cushion. The turbine oil absorbs vibration and shock from either the Hydroconstant Drive or your pump or fan.
- Since all power is transmitted through turbine oil, it has no rubbing parts (unlike variable speed clutches). We've enclosed all running parts in an oil-filled atmosphere in the drive housing.
- You can automatically control the drive one of three ways: By a pumped-liquid pressure hydraulic signal from the system. By a low pressure pneumatic signal. Or by an electrical signal from an appropriate controller.

Typical energy savings.*

Operating Characteristic	Pump with Hydroconstant Variable Speed Drive		Pump With Constant Speed	
	2000 gpm	800 gpm	2000 gpm	800 gpm
Annual operation hours	2,080	5,920	2,080	5,920
Pump KW	44.8	18.4	44.8	32.8
Hydroconstant Drive efficiency	93.2	80.0	—	—
Motor output KW	48.1	23.0	44.8	32.8
Annual power used KWh	236,208		287,360	
Power savings with Peerless Hydroconstant Drive	51,152 KWh per year			

**Assumes pump specifications of 2000 gpm design capacity, 100 feet design head, 84% pump efficiency, 70 feet static system head with 30 feet friction loss at 200 gpm.*

Other available publications

The following Peerless brochures describe several types of pumps and pumping equipment, which are also available without Hydroconstant Drives.

Brochure B-2300: Peerless models C & F close coupled and frame mounted end suction pumps. Flows to 3400 gpm. Heads to 280 feet.

Brochures B-1200 & B-1300: Peerless models AE & A single-stage horizontal split case pumps. Flows to 46,000 gpm. Heads to 675 feet.

Brochure B-4700: Describes electrical controls.

Brochure B-1400: Peerless models TU & TUT multi-stage horizontal split case pumps. Flows to 4500 gpm. Heads to 1600 feet.

Brochure B-2400: Peerless model TH, multi-stage, diffuser pumps. Flows to 525 gpm and heads to over 1000 feet.

Brochure B-4003: Describes the techniques of system analysis for pumping equipment selection, a method enabling you to determine the energy cost savings available through variable speed pump operations.

Custom-made factory-assembled and tested pumping systems which only require electrical and plumbing connections to be ready for operation.

Four models

Type MP Drive. *A space saving Hydroconstant Drive.*

This space saving drive has both the motor and the pump close coupled to the Hydroconstant Variable Speed Drive.

The motor is a National Electrical Manufacturers Association (NEMA) C-face induction type. (Sizes 6A and 8A use H.I. NEMA JM type motors up to 15 hp.) It comes with either an open drip proof, totally enclosed fan cooled, or explosion proof enclosure.

The pump is a Peerless Series C end suction type. It's available with either packing or mechanical seals.

The Type MP Drive unit comes completely assembled at the factory. It requires only simple electrical and piping connections on installation.

Because it's so compact, the Type MP Drive can save you floor space compared to other constant pressure systems.

Type M Drive. *Good space utilization combined with a wide variety of pump applications.*

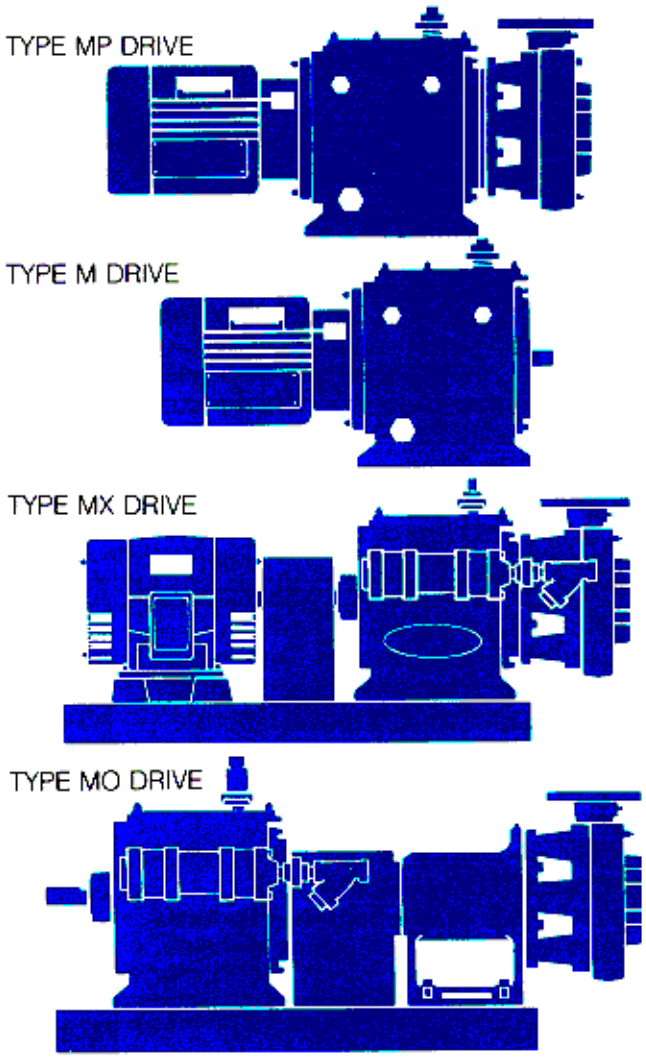
The Type M Drive features a compact conventional base mounting with a motor close coupled to the Hydroconstant Variable Speed Drive. The pump is base mounted and flexibly coupled to the Hydroconstant Drive.

The model combines with any type of Peerless base-mounted pump—single-stage horizontal split case, end suction, or horizontal multi-stage.

The pumps are available with either packing or mechanical seals.

The standard NEMA C-face induction motor has either an open drip proof, totally enclosed fan cooled, or explosion proof enclosure.

The Type M Drive offers good space utilization combined with a wide range of applications for different pumps.



Type MX Drive. *For specialized motor applications.*

The Type MX Drive has a compact conventional base mounting with a pump close coupled to the Hydroconstant Drive.

The pump is a Peerless Series C end suction type. It comes with either packing or mechanical seals.

The motor is base mounted and flexibly coupled to the Hydroconstant. This arrangement is particularly useful in 50 Hz power areas where NEMA motors are not normally used.

The MX arrangement is also useful when specialized 60HZ motors are required. In addition, the MX can be used on some close coupled pump applications where the horsepower is above the limits for the M or MP models.

Type MO Drive. *Versatility in selecting motor/pump combinations.*

The Type MO Drive features a pump, motor and Hydroconstant Variable Speed Drive all mounted on a common steel base. The Hydroconstant Drive is flexibly coupled to both the motor and the pump.

The motor is a horizontal type available in all standard NEMA enclosures.

Choose from end suction, horizontal single-stage or multi-stage pumps.

The fabricated steel base on which all three components are mounted makes this unit easy to install and handle.

Because of the wide variety of motor and pump types you can combine with the Type MO Drive, you can meet all sorts of application requirements.

Peerless Hydroconstant® Drive

How it works.

Hydroconstant drives vary pump or fan speed to hold constant a system condition. Sensing, local or remote can be used to control:

• Single point pressure • Flow • Liquid level
• Differential pressure • Temperture

It works on a hydrokinetic principle, using hydraulic oil for torque transmission.

In essence, it works like this:

1. An impeller mounted on the input shaft is coupled to a runner mounted on the output shaft by the hydraulic oil shared between them. At maximum oil levels, the output shaft speed is about 97% of the full load input shaft speed. As lesser amounts of oil are shared between the impeller and the runner, the output shaft runs proportionally slower.
2. In operation, a driver turns the input shaft that's fastened to the impeller. The runner is mounted on the output shaft close to and facing the input impeller. This output runner is enclosed by a cover which is mounted on and turns with the input impeller.
3. A nozzle directs hydraulic oil into the cover chamber. The speed of the Hydroconstant drive's output shaft is regulated by the position of the splitter arm (between the nozzle and the cover) which controls the amount of oil directed into the cover chamber. The splitter is spring loaded in one direction; its position is changed by an opposing load control device.
4. To accelerate the output runner and shaft, the splitter maximizes the flow of the oil into the cover chamber. (See figure A)
5. At constant speed, the oil is delivered into the cover chamber at the same rate that the oil is discharged through the cover's orifices around its periphery. (See figure B)
6. To decelerate the runner, the splitter minimizes the flow of oil into the cover chamber. (See figure C)

Several control devices are available. They sense and respond to a deviation from a present value in pressure, temperature, liquid level, flow or differential pressure.

Speed change sequence.

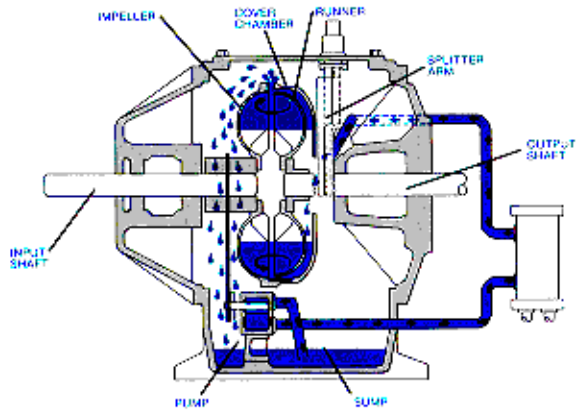


FIGURE A--ACCELERATION MODE

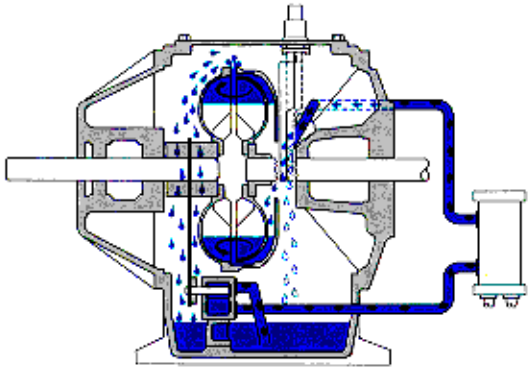


FIGURE B--CONSTANT SPEED MODE

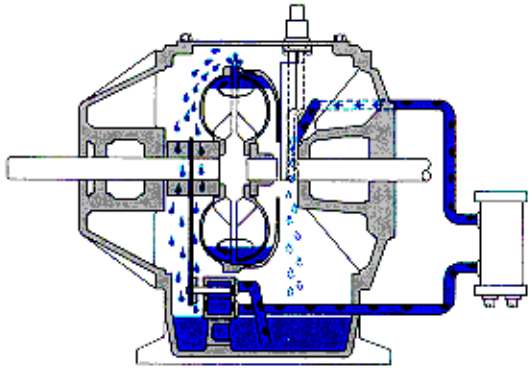


FIGURE C--DECELERATION MODE

Through the automatic adjustments of the splitter arm's position, it can move the sensed value toward its present reference value by acceleration or deceleration of the output shaft.

Performance Characteristics–Horizontal

Operating Data 60 Hertz

NOMINAL RPM*	TYPE	FLUID CPLG. SIZE	BHP IN		% SLIP		CIRC LOSS HP	% EFF.		BHP OUT		RPM OUT	
			FULL LOAD	115% LOAD	FULL LOAD	115% LOAD		FULL LOAD	115% LOAD	FULL LOAD	115% LOAD	FULL LOAD	115% LOAD
1750	M,MP,MO,MX	8A	3	3.45	5.0	5.5	.45	80.0	81.2	2.4	2.8	1640	1615
		8A	5	5.75	6.7	7.6	.45	84.0	85.2	4.2	4.9	1610	1580
		8A	7.5	8.62	9.3	11.0	.45	85.3	84.7	6.4	7.3	1565	1520
	M,MP,MO,MX	9B	7.5	8.62	4.2	4.65	0.5	89.1	89.5	6.7	7.71	1675	1665
		9B	10	11.5	5.1	5.6	0.5	89.9	90.1	9.0	10.4	1650	1640
		11B	10	11.5	1.86	2.1	0.75	90.8	91.5	9.1	10.5	1708	1700
		9B	15	17.25	6.65	7.3	0.5	90.0	89.8	13.5	15.5	1630	1620
		11B	15	17.25	2.45	2.65	0.75	92.6	93.0	13.0	16.0	1705	1700
		11B	20	23.0	2.9	3.1	0.75	93.2	93.6	18.6	21.5	1700	1695
		11B	25	28.75	3.2	3.5	0.75	93.8	93.9	23.5	27.0	1690	1685
		11B	30	34.5	3.6	3.95	0.75	93.4	93.9	28.0	32.4	1685	1680
		11B	40	46.0	4.4	5.0	0.75	93.7	93.4	37.5	43.0	1670	1660
		11B	50	57.5	5.45	6.4	0.75	93.1	92.3	46.8	53.1	1655	1635
	MO	14B	60	69.0	2.7	3.0	1.68	94.5	94.7	56.7	65.3	1720	1700
		14B	75	86.25	3.3	3.7	1.68	94.5	95.7	70.9	81.4	1710	1690
		14B	100	115.0	4.5	5.0	1.68	93.9	94.6	93.9	107.7	1695	1670
		14B	125	143.75	6.0	6.9	1.68	92.7	92.1	115.9	132.6	1675	1640
	MO	17B	150	172.5	2.5	2.8	3.6	94.2	95.2	141.3	164.2	1706	1701
		17B	200	230.0	3.0	3.4	3.6	94.2	95.2	188.3	218.8	1698	1691
		17B	250	287.5	3.5	4.0	3.6	93.8	94.8	234.5	272.6	1689	1680
3500	M,MP,MX,MO	6A	3	3.45	3.7	4.1	.55	76.7	81.2	2.3	2.8	3320	3285
		6A	5	5.75	5.0	5.5	.55	84.0	85.2	4.2	4.9	3275	3235
		8A	7.5	8.62	2.2	2.5	.70	88.0	89.3	6.6	7.7	3375	3340
		8A	10	11.50	2.8	3.1	.70	90.0	91.3	9.0	10.5	3355	3320
		8A	15	17.25	3.8	4.2	.75	91.3	91.6	13.7	15.8	3320	3280
	MO,MX	8A	20	—	4.6	—	.90	91.0	—	18.2	—	3340	—
			—	23.00	—	5.1	1.10	—	90.4	—	20.8	—	3300
		8A	25	—	5.2	—	1.35	89.6	—	22.4	—	3320	—
			—	28.75	—	5.8	2.25	—	83.5	—	24.0	—	3275
	M,MP,MO,MX	9B	15	17.25	1.9	2.05	1.6	87.4	88.7	13.1	15.3	3430	3425
		9B	20	23.0	2.25	2.4	1.6	89.8	90.6	17.96	20.8	3420	3415
		9B	25	28.75	2.55	2.75	1.6	91.1	91.7	22.8	26.4	3410	3400
		9B	30	34.5	2.8	3.0	1.6	91.9	92.4	27.6	31.9	3400	3395
		9B	40	46.0	3.3	3.55	1.6	92.7	93.0	37.1	42.8	3385	3375
		9B	50	57.5	3.6	4.0	1.6	93.2	93.2	46.6	53.6	3375	3360
	MO	9B	60	69.0	4.1	4.45	1.6	93.2	93.2	55.9	64.3	3355	3345
		9B	75	86.25	4.7	5.15	1.6	93.2	93.0	69.9	80.2	3335	3320
		9B	100	115.0	5.7	6.4	1.6	92.7	92.2	92.7	106.0	3300	3275

Water/oil cooler data for standard units

Fluid Coupling Size		6A, 8A					Vertical 9A, 11A; Horizontal 9B, 11B										Horizontal and Vertical 14B and 17B						
Motor Size	HP	3 Å	5	7.5	10	15	7.5	10	15	20	25	30	40	50	60	75	100	60	75	100	125	150	200	250
Maximum Water Flow Rate Required	GPM	.3	.5	.75	1	1.5	.75	1	1.5	2	2.5	3	4	5	6	7.5	10	6	7.5	10	12.5	15	20	25
	l/m	1.2	2	3	4	5.5	3	4	5.5	7.5	9.5	11	15	19	23	28	38	23	28	38	47	57	76	95
Minimum Water ΔP* Required	PSI	10	10	10	10	10	10	10	10	10	10	10	10	15	15	20	25	15	20	25	15	20	15	20
	kPa	69	69	69	69	69	69	69	69	69	69	69	69	103	103	138	172	103	138	172	103	138	103	138
Maximum Inlet Water Pressure		←					125 psig (850kPa)										→							
Maximum Inlet Water Temp.		←					80° F (27° C)										→							
Drive Oil Temperature		←					140° F ± 10° F (60° C ± 6° C)										→							

* On drives with 9B, 11B, 14B, 17B fluid couplings, pressure differential is measured between inlet of Y-Strainer and outlet of flow control valve.

Å 3 Hp. drives will require cooler use only if operating temperatures exceed 180° F. (70° C.)

Operating Data 50 Hertz

NOMINAL RPM	TYPE	FLUID CPLG. SIZE	BHP IN		% SLIP		CIRC LOSS HP	% EFF.		BHP OUT		RPM OUT	
			FULL LOAD	115% LOAD	FULL LOAD	115% LOAD		FULL LOAD	115% LOAD	FULL LOAD	115% LOAD	FULL LOAD	115% LOAD
1450	M,MP,MO,MX	9B	5	5.75	4.7	5.2	.4	87.6	88	4.38	5.06	1382	1375
		9B	7.5	8.62	6.3	7.0	.4	88.7	88.7	6.65	7.63	1359	1349
		9B	10	11.5	7.8	8.6	.4	88.5	88.3	8.85	10.15	1337	1325
		11B	7.5	8.62	2.35	2.55	.6	89.9	90.7	6.74	7.82	1416	1413
		11B	10	11.5	2.75	2.95	.6	91.4	92.0	9.14	10.58	1410	1407
		11B	15	17.25	3.35	3.6	.6	92.8	93.0	13.92	16.05	1402	1398
		11B	20	23.0	3.95	4.4	.6	93.2	93.0	18.64	21.40	1393	1386
		11B	25	28.75	4.7	5.3	.6	93.0	92.5	23.25	26.66	1382	1373
		11B	30	34.5	5.5	6.3	.6	92.6	92.1	27.78	31.76	1370	1359
1450	MO	14B	40	46.0	3.2	3.8	1.2	93.9	93.7	37.56	43.10	1404	1395
		14B	50	57.5	4.1	4.9	1.2	93.6	93.1	46.80	53.54	1391	1379
		14B	60	69.0	5.2	6.4	1.2	92.9	92.0	55.74	63.46	1375	1357
1450	MO	17B	75	86.25	1.9	2.2	2.57	94.8	94.9	71.1	81.8	1423	1418
		17B	100	115.0	2.5	2.8	2.57	95.0	95.1	95.0	109.4	1414	1410
		17B	125	143.75	3.2	3.7	2.57	94.9	94.7	118.6	136.1	1404	1397
		17B	150	172.5	4.0	5.5	2.57	94.4	93.2	141.6	160.7	1392	1371
		17B	200	230.0	6.0	8.0	2.57	92.8	91.0	185.6	209.3	1363	1334
2900	M,MP,MX,MO	8A	Refer to the Indianapolis factory for performance data.										
		8A											
		8A											
	M,MP,MO,MX	9B	15	17.25	2.4	2.65	1.2	89.8	96.2	13.47	16.60	2831	2823
		9B	20	23.0	2.9	3.2	1.2	91.3	91.7	18.26	21.10	2816	2807
		9B	25	28.75	3.3	3.65	1.2	92.1	92.3	23.02	26.55	2804	2794
		9B	30	34.5	3.75	4.1	1.2	92.4	92.6	27.72	31.94	2792	2781
		9B	40	46.0	4.5	4.85	1.2	92.6	92.7	37.05	42.62	2770	2759
		9B	50	57.5	5.1	5.4	1.2	92.6	92.6	46.31	53.26	2752	2743
	MO	9B	60	69.0	5.6	6.0	1.2	92.5	92.4	55.51	63.73	2740	2726
		9B	75	86.25	6.4	7.1	1.2	92.1	92.7	69.08	79.94	2715	2694

The performance of a variable speed pumping unit will be documented to reflect the head, capacity and Bhp based on the nominal tabulated performance data above. Field performance may vary due to actual motor Rpm, normal performance tolerance for the fluid coupling, and performance tolerance for the centrifugal pump.

Typical Specifications–Horizontal

Hydroconstant Variable Speed Drives

The variable speed drive(s) shall be the oil filled type capable of power transmission throughout its (their) complete speed range without vibration, noise or shock loading. The drive manufacturer shall have a minimum of twenty years variable speed drive manufacturing and application experience and shall furnish and be responsible for the proper function of all motors, pumps, controls, and sensors associated with the variable speed drives.

The equipment shall be

☐ shipped as a pre-piped, pre-wired packaged system.
☐ shipped as components for on-site installation.

Each variable speed drive shall be run tested by the manufacturer for operation at minimum and maximum speeds with the centrifugal pump load selected for the application or with the load of a dynamometer or similar calibrated device. The drive manufacturer shall provide written certification to the ☐ consulting engineer ☐ owner ☐ owner's representative that each drive operated properly during test and that the pump(s) supplied delivered its (their) specified flow and conditions. Absence of test certification will be grounds for equipment rejection by the owner or his representative. The owner/operator should be present at time of start-up for instructions on proper operation and routine maintenance procedures.

Drive Type

The variable speed drive shall be a horizontal, foot mounted drive with

☐ motor and end suction pump mounted directly on the drive housing. **Type MP drive**
☐ motor mounted directly on the drive housing and the ☐ pump ☐ fan ☐ load flexibly coupled to the output shaft, **Type M drive**.
☐ motor flexibly coupled to the drive input shaft and the ☐ pump ☐ fan ☐ load flexibly coupled to the drive output shaft, **Type MO drive**.
☐ end suction pump mounted directly on the drive housing and motor flexibly coupled to the drive input shaft., **Type MX drive.**

All equipment furnished with flexible shaft couplings shall have coupling guards. Variable speed drives, pumps and motors shall be mounted on a ☐ fabricated steel base ☐ fabricated steel drip rim base. The manufacturer shall accurately align flexibly coupled shafts prior to shipment. After field installation, but prior to grouting the base, a millwright or similarly qualified person shall verify or correct shaft alignment.

Driven Equipment

The equipment driven by the variable speed drive(s) shall be

☐ close coupled end suction pump(s)
☐ frame mounted end suction pump(s)
☐ horizontal split-case single stage pump(s)
☐ horizontal multi-stage pump(s)

☐ _____ centrifugal pump(s)

☐ _____ centrifugal fan(s)

as detailed in the following specifications.

(Note to specification writer: Variable speed drive specification may be completed by inserting specification details pertinent to the equipment being driven.)

Motors

The motor shall be a NEMA standard design B horizontal ball bearing motor

☐ close coupled (Types M and MP drives)
☐ flexibly coupled (Types MO and MX drives)

to the variable speed drive with a nominal full load speed of

60 Hertz speeds	**50 Hertz speeds**
☐ 3500 RPM (max. HP 100)	☐ 2900 RPM (max. HP 75)
☐ 1750 RPM (max. HP 250)	☐ 1450 RPM (max. HP 200)

when powered by electrical service rated _____ volts, _____ Hertz, three phase. The motor enclosure shall be ☐ open drip-proof ☐ totally enclosed fan cooled ☐ Class 1, Group D explosion proof ☐ premium efficiency. Motors shall be supplied which have greaseable ball bearings.

Electrical Controls and Sensors

All electrical control circuitry and system function sensors shall be supplied by the variable speed drive manufacturer. The primary power controls and motor starters shall be installed in ☐ the controls supplied by the drive manufacturer ☐ the motor control center installed by the ☐ owner ☐ electrical contractor.

The sensor(s) shall be located in the system to control drive speed as a function of

☐ constant pump discharge pressure.
☐ constant system pressure at the location designated on the plans.
☐ differential pressure control between the system piping supply and return headers at the location designated on the plans.
☐ differential pressure control at the location(s) designated on the plans.
☐ liquid level control in the sump location designated on the plans.
☐ flow control in the system at the location designated on the plans.

Connection between the sensor(s) and the variable speed drive controls shall be accomplished with

☐ hydraulic sensing lines: copper, brass or stainless steel.
☐ copper wiring on required leads for each sensor, not less than _____ gauge.
☐ telemetery as manufactured by _____ and supplied by the variable speed drive manufacturer.

All control wiring shall conform to National Electrical Code and the local electrical code of _____ (project location when applicable).

Submittals and Specification Compliance

The variable speed drive manufacturer shall provide _____ copies each of the following submittal data pertinent to the specified equipment, certified for construction, upon acceptance by the ☐ owner ☐ owner's representative ☐ plant manager ☐ consulting engineer ☐ architect:

- outline dimension drawing for motor/drive/pump assembly
- performance curve for ☐ pump ☐ fan ☐ load selected for this application
- general arrangement drawing for control panel compartments and components specified for this application
- drive manufacturer's product application brochures detailing the specified equipment to be a standard manufactured product
- installation, operation and maintenance manuals for pumps, drives and control equipment

Failure of the variable speed drive manufacturer to provide the specified data will be just cause to reject equipment.

PEERLESS PUMP

Peerless Pump Company
P.O. Box 7026 • Indianapolis, IN 46207-7026
Phone: (317) 925-9661 • Fax: (317) 924-7388

A member of the Sterling Fluid Systems Group

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